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EMERGENCY DEPARTMENT PAIN MANAGEMENT
DURING THROMBOLYTIC THERAPY
FOR ACUTE MYOCARDIAL INFARCTION:
A Descriptive Study

by

Marian Bernadette Nutt

A thesis submitted in partial fulfillment of the
requirements for the degree of

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Chapter I

Introduction and Purpose

Experiencing pain has always been a reality of human existence and seeking relief from pain has likely always been a natural response. Pain is often the chief complaint of people presenting to emergency departments (Selbst & Clark, 1990; Ducharme, 1994). Selbst and Henritig (1989) indicate that the factor of concentration upon life-threatening emergencies by health care professionals may result in a lower priority for relieving pain. Schecter (1989) noted that pain control in the emergency department has remained virtually unchanged in the last 20 years. In contrast, the protocol for diagnosing and treating the underlying cause of acute myocardial infarction (AMI) with thrombolytic therapy has become increasingly more technologically sophisticated, while the importance and timing of pain management is unclear.

Typically, the vast majority of patients experiencing an AMI will complain of chest pain. Although the intensity and duration of pain may vary considerably, patients may consider this pain to be the worst they have ever experienced (Herlitz, Hjalmarson, Holmberg, Ryden, Swedberg, Waagstein & Waldenstron, 1986). AMI caused by intracoronary thrombi can be relieved by administration of thrombolytic agents which dissolve clots and promote perfusion. The GUSTO investigators recommended that thrombolytics be given to the patient experiencing AMI no later than four to six hours after the onset of infarction to be effective (GUSTO 1993). Haak, Richardson, & Davey (1994) suggests that thrombolytic therapy should be

initiated within three to four hours of the onset of symptoms. The protocol for screening eligible candidates, obtaining essential baseline diagnostics, establishing additional intravenous (IV) access, and initiating the thrombolytic agent is both time dependent and labor intensive. Thrombolytic therapy can alter the course of AMI and limit the extent of tissue damage and subsequent morbidity. The shorter the time interval between the onset of symptoms and the administration of the thrombolytic agent, the better the outcome (Kennedy, Gensini, Tummis & Maynard, 1985; Gruppo, 1986; White, Norris, Brown, Takayama, Maslowshi, Bass, Ormiston & Whitlock, 1987; Haak et al., 1994). Similarly, the shorter the interval between onset of symptoms and treatment, the higher the resulting cardiac function (Koren, Weiss & Hasin, 1985; Simoons, Serruys, van den Brand, Bar, de Zwaan, Res, Verheugt, Krauss, Remme & Vermeer, 1986; White et al., 1987; Haak et al.., 1994).

<u>Problem Statement and Purpose</u>

Thrombolytic therapy constitutes the standard of practice for patients who present to the hospital with AMI (GUSTO 1993). But how is pain management integrated into this scenario in the emergency department (ED)? To date, no one has explored the timeliness, frequency or effectiveness of pain management in the ED while persons experiencing AMI are started on thrombolytic agents.

The purpose of this study was to analyze to what extent pain management is integrated into thrombolytic therapy initiated in the ED. A retrospective chart review was conducted utilizing a thrombolytic administration data retrieval form designed for ED records.

Specific aims of this study focused on the following research questions:

1) How often and how quickly is the initial pain assessment made by the ED nurse?

2) What medication categories are utilized to treat pain and with what frequency?

3) How often does reassessment of pain occur?

4) From the time of arrival in the ED, are the following time interval related:
- initial medication intervention for pain
- reassessment of pain (medication effectiveness)
- obtaining the first ED 12 lead EKG
- initiating a thrombolytic agent?

5) How does pain management for patients transported to the ED by ambulance compare to pain management for patients who arrive by privately owned vehicle (POV)?

Significance

Each year, approximately 1,250,000 persons experience a cardiac emergency, of which about 500,000 result in death(National Institutes of Health, 1993). About one half, or 250,000 of the deaths occur suddenly, defined as within one hour of the onset of symptoms (NIH, 1993). Diseases of the heart and vascular system account for more deaths in the United States than any of the other causes of death combined (NIH, 1993). For those who receive care soon enough, thrombolytic therapy can alter the course of AMI and limit the extent of damage and subsequent morbidity (Koren et al., 1985; Simoons et al., 1985; White et al., 1987; Colletti, 1990, Martin, Chesnick & Young, 1990; GUSTO 1993).

There have been relatively few studies examining nurses' management of

cardiac pain despite the fact that the majority of AMI patients depend upon nurses to administer intravenous narcotic analgesics for pain relief. Acute pain such as that experienced in AMI, elicits reflexes that can have deleterious effects on the patient's overall status. Tachycardia, increased cardiac output, hypertension, decreased gastric motility, vasoconstriction and increased ventilation are all associated with experiences of acute pain (Bonica, 1991; Haak et al, 1994). Because of the impact on already compromised myocardial tissue, both early thrombolytic therapy and early pain control are in the patient's best interest. Indeed, management of acute pain is critical to the total care of the patient (Bonica, 1991).

Pain management is a multidisciplinary responsibility. Sullivan (1994) notes that nurses alone cannot achieve optimal pain management. However, nursing has a unique role among all health professionals in that the nurse spends the most time with the patient, assesses the patient's pain level, identifies the impact of pain relief, and provides ongoing reassessment and documentation.

Tenabe (1995) recognizes that the ABC's (airway, breathing and circulation) are always the first concern in the ED, but she proposes that a pain management component be added as the D (discomfort) in the primary survey. Assessment of discomfort would increase the ED nurse's awareness of the importance of pain management. However, the need to identify the current status of pain management in relation to other essential priorities in the ED is a glaring gap in the nursing research literature.

Chapter II

Review of the Literature and Conceptual Framework

Pain Management in the ED

The inadequate treatment of severe pain in the ED was first addressed in

England in 1987. One hundred physicians from 14 different accident and EDs

completed a seven item questionnaire. Each item presented a different patient

scenario with acute pain severe enough to require intravenous (IV) administration of

analgesics. Unstable angina was one of the scenarios. Physicians were asked to

determine which drug, dose and route to use in the pain management. Results

indicated that 50% of the physicians would have used an inappropriate route

(intramuscular instead of IV) and 20% would have waited 90 minutes or longer

before administering more analgesia after inadequate pain relief (Reichl & Bodiwala,

1987). Obviously, many of these patients with severe pain would not have pain relief

in the ED under these circumstances.

Wilson and Pendleton (1989) reviewed records of 198 patients who came to

the ED with pain and were eventually admitted to the hospital. Of these, 98%

reported severe to moderate pain and only 2% rated their pain as mild. Fifty-six

percent of these patients received no analgesics in the ED. Of those who did receive

medication, 69% waited one hour and 42% waited at least two hours before receiving

analgesics. Pain was further classified as intraabdominal, musculoskeletal, or

intrathroacic. Of these three groups, the patients with intrathoracic pain were the

least likely to receive analgesics. Once again, inadequate pain management practices

were demonstrated and patients with chest pain may be the least likely to have their pain relieved in the ED. The expedience and effectiveness of pain management by ED nurses remains unexplored.

Pain Management for Patients with AMI

No literature specific to the pain management of patients with AMI in the ED could be found. Three studies conducted in the coronary care unit (CCU) setting were available. The results provide impetus for further study of pain management during the initial phase of AMI in the ED.

Bondestam, Hovgren, Gaston-Johansson, Jern, Herlitz, and Holmberg (1987) in a study of 47 AMI patients, found that 40% were not totally free from pain in the first 24 hours in the CCU. Willetts (1989) reported that less than half of the 20 patients diagnosed with AMI received pain relief within 30 minutes of administration of analgesics. While in the CCU, 16 of these 20 patients felt their pain had never actually been relieved.

The largest study was a comparison of 100 CCU patients' and 10 experienced CCU nurses' ratings of the intensity of ischemic chest pain. Pain assessment was monitored over an eight week period. A linear regression to predict patients' pain scores from nurses' ratings indicated a strong relationship ($R2 = 89\%$, $p < 0.001$) (Thompson, Webster & Sutton, 1993). Both groups rated pain using a visual analogue scale; however, the ratings were obtained sequentially not simultaneously. Only the assessment component of pain management was examined.

Much more research is needed if pain management in AMI is to be

scientifically based. In this study, pain management will include three components:

assessment, intervention with medications, and reassessment.

<div align="center">Current Clinical Concepts in Pain Management</div>

In 1994, the Agency for Health Care Policy and Research (AHCPR) published

clinical practice guidelines that were developed by a private sector panel of

emergency, family and internal medicine specialists; cardiologists; cardiac surgeons;

nurses; and consumer and public health representatives. Supported by AHCPR and

the National Heart, Lung and Blood Institute (NHLBI), the guidelines have become

accepted as the standard of care in chest pain management. The AHCPR guidelines

state:

> *"Patients considered to have ongoing manifestations of unstable*
> *angina should receive intensive medical management. The goals of*
> *this phase of care are to relieve pain and ischemia and to prevent*
> *the progression of the underlying disease process to MI or death.*
> *Aspirin (ASA), heparin, nitrates and beta blockers begun at the*
> *of initial evaluation should be titrated to a dosage adequate*
> *to relieve ischemia but avoid hemodynamic compromise. Morphine*
> *sulfate (MS) may be necessary to relieve severe anginal symptoms*
> *that have not resolved with initial therapy."*

Unfortunately, the guideline is specific for unstable angina associated with

acute presentation of coronary artery disease and excludes those patients with

reperfusion-eligible AMI at the conclusion of the initial evaluation. However, it must

be acknowledged that the guidelines are applicable at least through the diagnostic ED

workup because this is typically the site of initial evaluation. The most commonly

used ED medications for management of unstable angina and AMI up to the decision

to use thrombolytics are clearly identified in a chart contained in the AHCPR

guidelines (Appendix A).

Narcotics are a major pharmacological modality in the management of most moderate to severe pain syndromes (Gaston-Johansson, Hofgren, Watson & Herlitz, 1990). The routine treatment of acute chest pain in suspected AMI is IV injections of morphine sulfate in doses of 5 mg, which can be repeated until pain is relieved or up to a total dose of 20 - 25 mg given in approximately two hours. This is consistent with current treatment recommendations in cardiac care (Gaston-Johansson et al, 1990; AHCPR, 1994).

According to the Emergency Nursing Core Curriculum (1994), effective thrombolytic therapy is determined by four expected outcomes: 1) chest pain, oxygen supply and demand imbalance corrected, 2) increased systemic tissue perfusion, 3) increased cardiac output, 4) fear and anxiety alleviated (Kearney,1994). It is clear that ED nurse professionals consider pain management an essential priority as demonstrated by emphasis on chest pain relief and alleviation of fear and anxiety.

In Canada, Ducharme (1994) notes that very few EDs have written policies on either pain assessment or treatment. Emergency pain management should be considered as important a therapeutic modality as any other aspect of patient care. This pain management should not prevent ongoing patient assessment and treatment. But it should be considered poor patient care not to treat pain while attempting to arrive at a diagnosis (Ducharme,1994). Research examining pain management in an increasingly technologic ED environment is sorely lacking. This descriptive study is an important initial approach to improving the management of acute pain in the

patient receiving thrombolytic therapy.

Conceptual Framework

In the past, pain had often been described as having either a physical or psychological etiology. However, attitudes are changing as a result of recent advances in the study of pain. In light of research on neurotransmitters and discoveries of the ways in which the mind can influence the function of the body, the sensation of pain must now be viewed as reflecting the interaction between mind and body (King, 1991). This is a more holistic approach.

According to Loeser and Egan (1989), physicians have been slow to tackle the problem of pain management for two reasons: 1) modern physicians are more likely to be concerned with specialization and technology than with nonntechnological problems such as pain and 2) the current medical model is based on the Cartesian concept of mind/body dichotomy; pain is difficult to explain using this model. One implication for ED nurses is that it may be difficult to obtain a physician order to treat pain in emergent time dependent situations such as thrombolytic therapy. Maxwell (1992) observes that since nursing is traditionally aligned with medicine in an approach to pain, nurses can learn from Loeser's (1989) philosophy. Health care professionals must examine current practices in light of new knowledge so effective approaches to acute pain management can be identified and implemented. While the experience of pain is at least as old as humanity, the science of pain and pain management is new (Bonica, 1991).

The withholding of pain medication until a diagnosis is made is a practice that

continues to exist in many EDs. This remains a controversial topic in emergency medicine (Tenabe, 1995). The American Pain Society (1992) includes the following as an official policy statement:

> *"In cases in which the cause of acute pain is uncertain, establishing a diagnosis is a priority but symptomatic treatment of pain should be given while the investigation is proceeding. With the occasional exception (ie: the initial examination of the acute abdomen) it rarely is justified to defer analgesia until a diagnosis is made. In fact, a comfortable patient is better able to cooperate with diagnostic procedures."*

Levine's Conservation Model (1973) provides the theoretical basis for this descriptive study. In this nursing model, the focus is the individual as a holistic being and the primary concern is maintaining the integrity of the person. Adaptation is the process through which the integrity of the individual is supported. There are four principles which promote the adaptation process in patients:

1) conservation of the individual's physiological and psychological energy

2) conservation of structural integrity, that is body form and function

3) conservation of personal integrity, that is self esteem and identity

4) conservation of social integrity, that is familial and community affiliations.

The experience of acute pain taps the individual's energy resources. The physiological and psychological impact is dependent upon many factors, including the location, quality, intensity, and duration of the pain to name only a few. Ischemic injury has broad implications for the patient, from myocardial damage to death. Maintaining a sense of control in situations of acute pain is unlikely. Rapid, highly technological interventions could lead the patient to conclude that he is helpless in the

face of established protocols. Pain relief may remain the patient's priority while the health care team is perceived by the patient to have many other priorities such as obtaining an EKG or administering thrombolytics. The patient is in the unique position of being the center of attention but with little control over how that attention is directed.

Levine's model emphasizes the nurse's responsibility to maintain the patient's integrity in the threat of assault through illness or environmental influences. In the ED, the very interventions designed to maximize long term health may be seen by the patient as an overwhelming assault. The patient, not the health care professional, is the most reliable source of pain information. Simple pain intensity scales are accurate indicators of a patient's degree of pain and are an excellent tool for critical care and ED environments (Tenabe, 1995).

Chapter III

Methodology

Design

A descriptive retrospective chart review was used to determine the extent to which pain management was integrated into thrombolytic therapy in the ED setting. The main objective of descriptive research was the accurate portrayal of the characteristics of situations and the frequency with which certain phenomena occur (Polit & Hungler, 1991). A retrospective chart review is necessary to expedite documentation of pain management in the ED for a sample of 100 patients who received thrombolytic therapy for AMI. A sample of this size would be difficult to accrue in a timely manner with a prospective design.

Sample

The population for this study includes persons admitted through the ED with complaints of chest pain or diagnosis of unstable angina/AMI who subsequently receive thrombolytic therapy in the ED. The ED is a 16 bed, Level 2 (JCAHO) facility, within a 250 bed acute care hospital located in the Pacific Northwestern United States. The ED provides direct care to approximately 30,000 patients per year. Twenty-five percent of the adult patients arrive via ambulances, 15-20 % of the adults require hospital admission, with 35% of those admitted requiring critical care services. Approximately four patients per month, 50 patients annually, receive thrombolytics in the ED or cardiac catheterization lab prior to admission to a critical care unit.

The chart review was performed on a total of 100 records. Since current data is sought, the review began with December 1993 and progressed through March 1996 with the sample goal of N=100. The study facility established a computerized medical records system in December 1993 which allows identification of a sample by a computer code number (ICD9 code) related to diagnosis and treatment. Criterion for exclusion were patients who received thrombolytics for other than AMI or who received thrombolytics in a critical care unit other than the ED.

Definitions

Acute myocardial infarction - any process of heart muscle ischemia with sufficient severity and duration to result in permanent myocardial damage.

Unstable angina - chest pain that occurs at rest, new onset of pain with exertion or pain that has accelerated (more frequent, longer in duration or lower in threshold).

EKG - a 12 lead electrocardiogram; a tracing of the heart's electrical conduction derived from amplification of the minutely small electrical impulses generated by the heart.

Thrombolytic agent - any pharmacological agent within a class of drugs that can break up clots (streptokinase and tissue plasminogen activators.)

Pain management - includes three components: pain assessment, intervention with medication, and pain reassessment.

Pain assessment - initial documentation as to the patient's description of pain quality, location, duration or intensity including a simple pain intensity scale (1-10).

Pain reassessment - any subsequent documentation as to the patient's description of pain quality, location, duration, or intensity including

a simple pain intensity scale (1-10).

Medication effectiveness - any reassessment after the administration of any of the following drugs: ASA, nitrates, heparin, beta blockers, narcotics

Instrument

A data retrieval form to evaluate thrombolytic administration has been in use at the facility for hospital peer review and quality improvement functions only. To describe pain management in thrombolytic therapy, it was necessary to modify the data retrieval form in the following ways:

1) All patient identification information was eliminated. Records were identified by sample item numbers 1 through 100 for data entry purposes.

2) The mode of arrival and medications given prior to arrival in the ED were included to provide necessary preliminary information of pain management in transit. Choices of medications and doses in the ED would be affected by medications already administered.

3) Actual times of arrival in and departure from the ED were necessary to calculate the total time spent in the ED. This time interval was compared with the total number of pain reassessments and frequency distribution determined.

4) Medications given in the ED that were recorded on the form are: ASA, nitrates, heparin, beta blockers, and narcotics. The study facility has established standard physician orders for thrombolytic orders in AMI. Appendix B contains a copy of these orders which include specific reference to narcotics and nitrates for management of pain.

5) The thrombolytic agent was identified as streptokinase or tissue plasminogen activators.

6) The standard of care at this facility was reflected by the measurements of EKG obtained within 10 minutes of arrival and thrombolytic agent started within 45 minutes of arrival. No policy specifications were made as to the first pain assessment or first pain medication administration. These two actual times were recorded on the modified form to facilitate comparison of current pain management practices with established diagnostic (EKG) and treatment (thrombolytic agent) protocols.

Comments that might further describe any of the above were included under the sample item number and on additional paper as required. Both the original and the modified retrieval forms are included in Appendices C and D, respectively. The modified form was submitted to the human subjects review committee of the study facility and approval was obtained prior to initiating data collection.

The original form has been in use for over two years. Reliability and content validity were established through the research literature and current quality assurance standards. A small pilot study was conducted with the modified form to establish content validity and rating consistency. Three registered nurses currently certified in emergency nursing analyzed the items to see if they adequately represented the purpose of the instrument in relation to the five research questions. Five charts were reviewed by the principal investigator using the modified form and one week later the same five charts were reviewed to establish intra-rater reliability. There was a 99% agreement (Kappa = .99). In addition, the emergency clinical nurse specialist in the

ED and the principal investigator reviewed records for February and March 1996 using the modified form to determine inter-rater reliability. In this situation, there was 90% agreement between the two (Kappa = .89). The category with the greatest disagreement was M (the total number of pain reassessments). One recorder had erroneously included the initial assessment in this total. This confusion served to clarify the intent of this category.

Methods of Procedure

Approval was received from the facility's human subjects review committee in early February 1996 and from the University of Washington (UW) Human Subjects Committee the first week of March 1996 (Appendix E).

Entry into the medical records section of the facility was supported by the ED clinical nurse specialist who is also a member of the UW clinical faculty. A computerized list of records identified by the ICD9 code was generated by the facility information services. Medical records personnel were able to pull nine records for review. The principal investigator pulled the balance of the study sample from the facility file room. The principal investigator reviewed the charts and hand recorded raw data on the modified form within the medical records area. The pilot study was completed within one week following approval of the necessary review committee authorities. The review of 100 charts and data collection was accomplished during the four weeks following the pilot study.

Protection of Human Subjects

No patient identification information was recorded on the modified

data retrieval form. Patient names or other identification information were not coded. No identification information on the health care staff was recorded. All modified forms were completed by the principal investigator. Raw data were reviewed by only the investigator, the ED clinical nurse specialist and the faculty advisor. Data were entered into the personal computer of the investigator, under a confidential access code.

Modified forms will be kept in a fire safe locked box at the home of the investigator. The investigator received a letter of permission from the facility and signed an oath of confidentiality (Appendix F) prior to data collection. Information was reported in aggregate form and data will be destroyed one month after completion and approval of the final study by the thesis committee.

Data Analysis

The information from the modified form was coded and entered into the personal computer of the principal investigator for analysis. Since this is a descriptive study, descriptive statistics including frequencies and correlation were used to analyze the distribution of data. The software support for this analysis was provided by Microsoft Excel 5.0.

The frequencies of pain assessment, intervention, and reassessment were analyzed with descriptive statistics using variables E, J, K, L and M on the instrument. The timing of the first pain assessment was described with frequency distribution and measures of central tendency using variables C and J on the instrument.

From the time of admission, pain management was compared to the initial

diagnostic EKG and thrombolytic administration with measures of central tendency using variables H, I, J, K and M on the instrument.

The timing of the first pain assessment and first pain med given was compared with a t-test for interval level variables (C, J, K) and numerical variables (A & B) for two groups: those who arrived in the ED via ambulance and those who arrived via privately owned vehicles.

Chapter IV

Results

The purpose of this chapter was to review the findings from the data collected. The study was conducted to: 1) determine how often and how quickly an initial pain assessment was made by the ED nurse; 2) determine what medication categories were used in the ED to treat pain initially and with what frequency; 3) describe how often pain is reassessed; 4) describe relationships among the time intervals for pain medication, reassessment, first EKG and first dose of thrombolytic; and 5) compare the pain management for those transported to the ED by ambulance with those transported by private vehicle (POV).

Characteristics of the Sample

A total of 100 medical records were reviewed. Eighty-one charts met the inclusion criteria. The main reasons for exclusion from the study included receiving thrombolytics for diagnoses other than AMI ($n = 7$) and receiving the first dose of thrombolytics after transfer to an inpatient CCU ($n = 12$).

Data were analyzed according to frequency distribution. Subjects ranged in age from 35 to 89 years, with a mean age of 61.6 years (SD 12.7). Female subjects were older with a mean age of 67.3 years (SD 12.5) than male subjects, with a mean age of 59.3 years (SD 12.0), ($t = 2.6611$, $p<.01$). As shown in Table I, most of the subjects were male (72%), diagnosed with an inferior AMI (63%), with a current or previous history of tobacco use (54%). Ethnicity is no longer included in the demographic information of the facility's records; however this information was

Table I - Individual Characteristics of the Study Subjects
n = 81

Characteristic	Freqency	Percentage
Age (years)		
35 to 39	3	4%
40 to 49	12	15%
50 to 59	20	25%
60 to 69	19	23%
70 to 79	20	25%
80 to 89	7	8%
Gender		
Female	23	28%
Male	58	72%
Tobacco Use		
Never	36	45%
Currently	30	37%
Previously	14	17%
Not Specified	1	1%
Ethnicity		
Caucasian	31	38%
African American	3	4%
Hispanic	1	1%
Native American	2	3%
Asian/Pacific Islander	4	5%
Not Specified	40	49%
Location of AMI		
Inferior	51	63%
Anterior Wall	28	35%
Inferoposterior	1	1%
Anterolateral	1	1%
Final Disposition		
Discharged	77	95%
Expired	4	5%

frequently reported in the EMS ambulance records. The majority (64%) of the sample arrived in the ED via ambulance. Ethnicity was not able to be determined in 49 % of the records. Thirty-one subjects (38%) were identified as Caucasian and ten subjects (13%) were of other ethinic orientation.

All subjects survived through transfer to an inpatient critical care unit, with 77 (95%) eventually discharged from the facility. All four (5%) deaths occurred longer than 24 hours after arrival in the ED.

Frequency and Timing of Initial Pain Assessment

The first purpose of the study was to determine how often and how quickly an initial pain assessment is performed by the ED nurse for patients undergoing thrombolytic therapy for AMI. An initial pain assessment was documented on 79 records (97 %). One subject was undergoing resuscitation for cardiac arrest and one subject had no assessment of pain prior to receiving nitrates and narcotics.

The time interval range for the initial pain assessment from time of arrival in the ED was 0 (immediately) to 33 minutes. The mean assessment interval was 1.3 minutes (SD 4.8). Figure 1 illustrates the frequency distribution for the initial pain assessment.

Nitrates and Narcotics as Medications for Pain

In the ED, nitrates were administered by the following routes: topical ointment, sublingual and IV infusion. Fifty-three subjects (65%) received both sublingual doses and IV infusions. Seventeen subjects (21%) received IV infusions only, while seven subjects (9%) received sublingual nitrates only. One subject (1%)
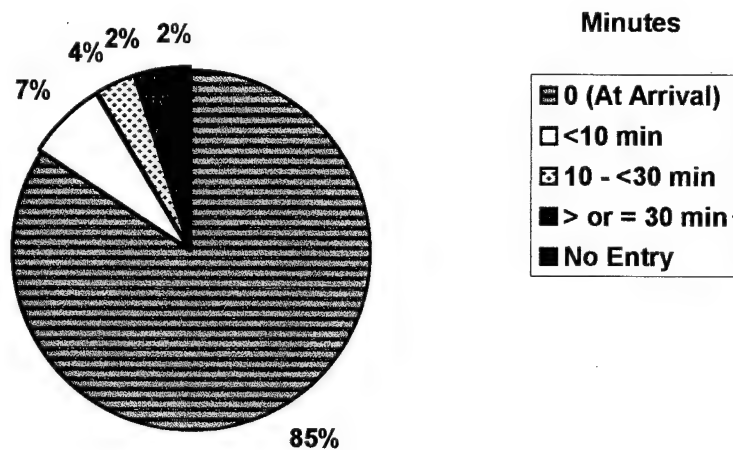
Figure 1 - Timing of Initial Pain Assessment

received both topical ointment and IV infusion. Nitrates were not administered to three subjects; one was in cardiac arrest and two were severely hypotensive.

Three different narcotics were administered in the ED: morphine sulfate was given to 52 subjects (64%), dilaudid was given to eight subjects (10%), three subjects received doses of both morphine and dilaudid and one received morphine and hydromorphone. Seventeen subjects (21%) did not eceive any narcotics in the ED.

The two categories of medications used to treat pain in the patient experiencing AMI were nitrates and narcotics. Only one subject did not receive either category and this subject was in cardiac arrest. Figure 2 illustrates the percentage of the sample who received only nitrates, only narcotics, and both nitrates and narcotics for pain in the ED.
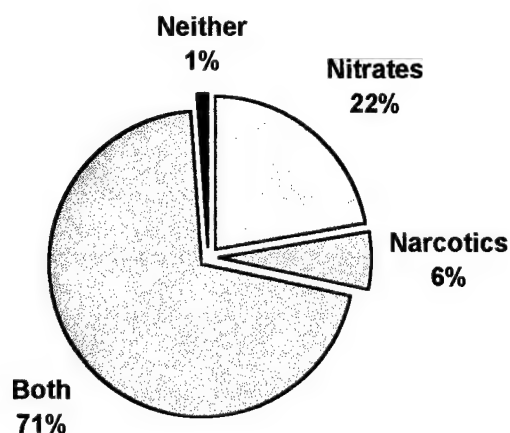
Figure 2 - Nitrates and Narcotics for Pain in ED

Frequency of Pain Reassessments

The number of reassessments for pain by the ED nurse is illustrated in Figure 3. Six records (7%) had no reassessment of pain. Of these six, three were in third degree atrioventricular block, one in cardiac arrest.

Seventy-five records (93%) had reassessments documented a total of 409 times. For those who were reassessed, the number of reassessments ranged from 1 to 19 and the mean was 5.5 (SD 3.8). The frequency distribution for total time spent in the ED and the number of reassessments for pain is illustrated in Table II.

Table II- Distribution of Time in the ED and Pain Reassessments

Total Time in the ED in 30 Minute Increments	Sample Frequency	Sample Percent	Number of Reassessments	Percent of Reassessments
>30 min < 60 min	17	21%	55	14%
>60 min < 90 min	24	30%	107	26%
>90 min < 120 min	23	29%	114	28%
>120 min < 150 min	7	8%	48	12%
>150 min < 180 min	5	6%	43	10%
>180 min	5	6%	42	10%
Total	81	100%	409	100%
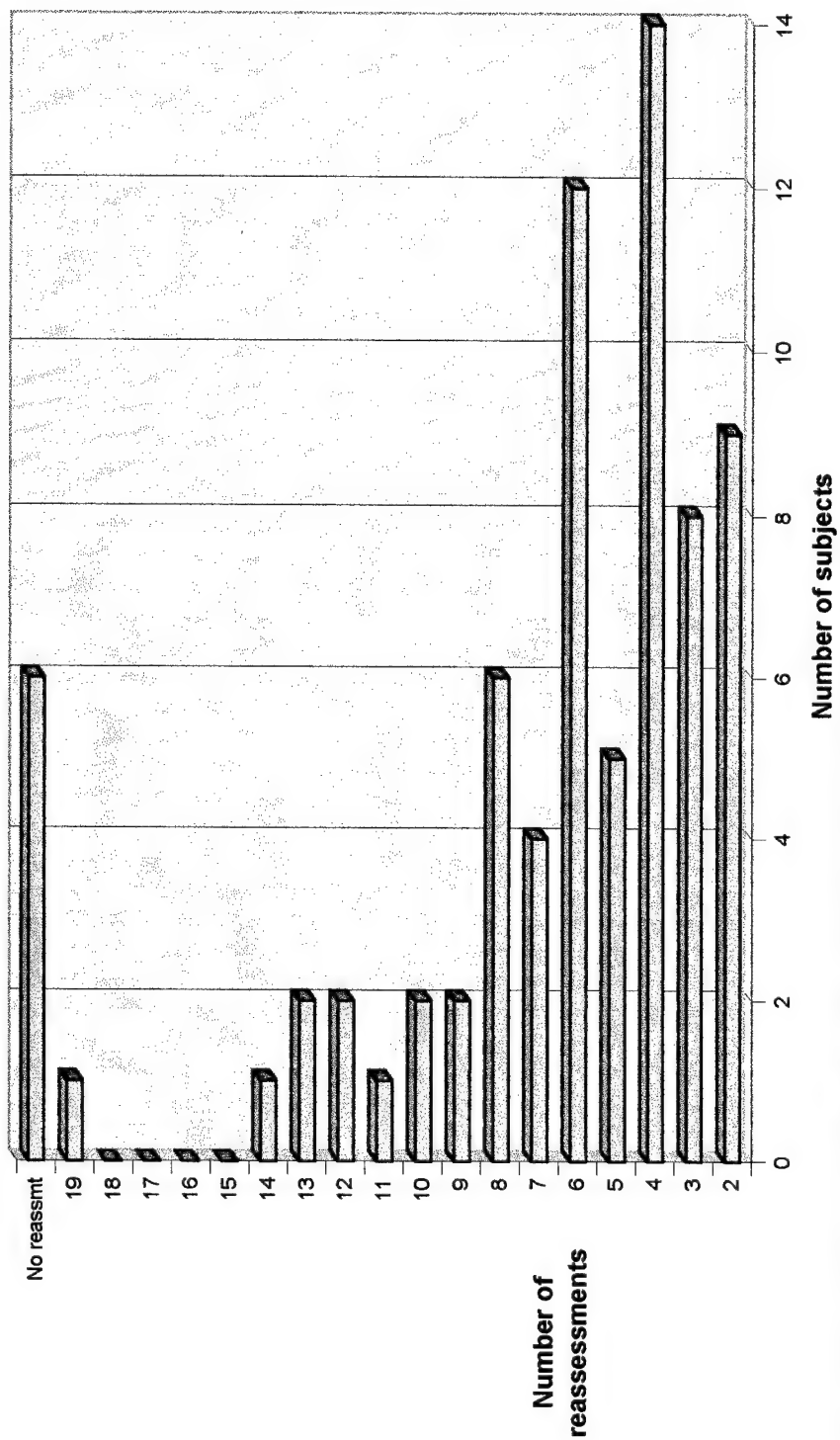
Figure 3 - Frequency Distribution of Reassessments for Pain

Relationships Among First Pain Medication, Reassessment, Initial EKG, and Thrombolytic Administration

The range for time intervals from arrival in the ED to first dose of pain medication was 0 to 80 minutes. The mean was 22.5 minutes (SD 18.4). There were no entries on 4 (5%) records. The mean time interval from the first pain medication dose to the first reassessment was 10.6 minutes (SD 9.8). The range was 0 to 50 minutes. Eleven records (14%) had no reassessment entries. The initial EKG performed in the ED ranged from 0 (upon arrival) to 51 minutes. The mean time interval was 9.9 minutes (SD 3.0) from the time of arrival. The first dose of thrombolytic agent was administered from 7 to 170 minutes with a mean time interval of 56.3 minutes (SD 31.4).

The time interval for the first pain medication administered was not associated with the time interval for first pain reassessment ($n = 70$, $r = -0.19$, $p > 0.2$) The time interval for first pain medication was positively associated with the time interval for first EKG ($n = 77$, $r = 0.51$, $p < 0.01$). Therefore, the shorter the time interval for the first pain medication administration, the sooner the first EKG was obtained.

The time interval for first pain assessment was positively associated with the time interval for thrombolytic dose ($n = 77$, $r = 0.33$, $p < .01$). Thus, the shorter the time interval for the first pain medication administration, the earlier the first dose of thrombolytics was given. The time interval for first EKG was positively associated with the time interval for thrombolytic dose ($n = 81$, $r = 0.44$, $p < 0.01$). This means the shorter the time interval for the first EKG, the quicker the first dose of

thrombolytic was administered.

<div align="center">

Comparison of Subgroups Transported to the ED by Ambulance
and by Privately Owned Vehicles

</div>

Fifty-two (64%) subjects were transported by ambulance. During ambulance transport, 41 were given nitrates only, 19 received both nitrates and narcotics, and 11 did not receive nitrates or narcotics.

The subgroup transported by POV included 29 subjects (36%). Twenty-one in this group had no pain medications prior to arrival. Sublingual nitroglycerin was the only medication specified for pain relief by eight of these subjects.

The time interval to initial pain assessment ranged from 0 to 33 minutes for those who arrived by ambulance, with a mean time of 1.3 minutes (SD 5.2). Both the median and the mode were 0, indicating assessment was accomplished at the time of arrival. For those who arrived by POV, initial pain assessment ranged from 0 to 20 minutes, with a mean time of 1.2 minutes (SD 4.0). Again, median and mode were both 0. The time interval to initial pain assessment did not differ between patients who arrived by ambulance verses POV.

The first dose of pain medication for the ambulance subgroup was given at the mean time of 19.6 minutes (SD 14.7). The range was 0 to 72 minutes. The first dose of pain medication for the POV subgroup ranged from 1 to 80 minutes, with a mean time interval of 27.7 minutes (SD 22.4). The time intereval from arrival in the ED to first pain medication dose did not differ between patients who arrived by amulance verses POV.

For the ambulance subgroup, the time interval from medication dose to first reassessment ranged from 2 to 46 minutes, with a mean of 10.9 minutes (SD 9.6). For the POV subgroup, the time interval from medication dose to first reassessment ranged from 1 to 50 minutes and the mean was 11.3 minutes (SD 22.6). The time interval from pain medication dose to first reassessment for pain did not differ between the ambulance and POV subgroups.

The time interval from ED arrival to first EKG ranged from 0 to 43 minutes for the ambulance subgroup, with a mean of 7.7 minutes (SD 7.9). For the POV subgroup, the time interval from arrival in the ED to first EKG ranged from 0 to 51 minutes, with a mean of 13.7 minutes (SD 10.8). Patients who arrived by ambulance received initial EKG earlier than those who arrived by POV ($t = 2.826$, $df = 79$, $p < 0.001$).

For the ambulance subgroup, thrombolytic agents were initiated in a time interval range of 19 to 170 minutes. The mean was 51.9 minutes (SD 15.9). In the POV subgroup, the time interval range for the initial thrombolytic agent was 7 to 154 minutes. The mean was 64.3 minutes (SD 37.7). Patients who arrived by ambulance received thrombolytics earlier than those who arrived by POV ($t = 1.694$, $df = 79$, $p < 0.05$).

Chapter V

Discussion and Recommendations

This study was conducted to describe the integration of pain management during thrombolytic therapy for AMI in the ED. Pain management included initial pain assessment, administration of medication for pain, and reassessment of pain. The specific aims of this study were to: 1)determine how often and how quickly an initial pain assessment was made by the ED nurse; 2) determine what medication categories were used in the ED to treat pain and with what frequency; 3) describe how often pain was reassessed; 4) describe the relationship among the time intervals for first pain medication, first reassessment, first EKG and first dose of thrombolytic; and 5) compare the pain management for those transported to the ED by ambulance with those transported by POV.

The majority of the patients were assessed for pain immediately upon arrival in the ED. This assessment was documented with other initial observations by the ED nurse in the triage note. The inclusion of a pain assessment in this earliest documentation leads to the conclusion that the pain status of the patient is considered as important as the vital signs, description of physical appearance and brief medical history.

Nitrates and narcotics were the two categories of medications used to treat pain in these patients. The national guidelines for the management of pain in the unstable angina patients (Appendix A) are appropriate for this study in which the focus was initial pain assessment, first pain medication, and reassessment. The

distinction between unstable angina and AMI often cannot be difinitively made during the initial patient evaluation. The facility standing orders (Appendix B) specify both nitrates and narcotics for the treatment of pain in situations of thrombolytic therapy for AMI. At least in this study facility, there is a consistent pain management strategy for the patient with unstable angina who is diagnosed with AMI.

Nitrates were used for all but three subjects, who were experiencing severely compromised hemodynamics. The route of choice for nitroglycerin in the ED was IV drip. The significance of this route is that the dose can be titrated to the patient's pain and blood pressure(B/P). Morphine sulfate was the most frequently administered narcotic. Even when dilaudid was used exclusively, a documented allergy to morphine sulfate was given as the reason for this choice of narcotics. It can be concluded that the narcotic of choice, then, was morphine sulfate.

One fifth of the subjects did not receive any narcotics. This is a particular concern because no explanation was given as to why narcotics were not used. Medication intervention for pain in this group must have been based upon titration of the nitroglycerin drip. This could prove ineffective because adequate B/P is a prerequisite for increasing the dose delivered by nitroglycerin infusion.

The interval for reassessment of pain was widely distributed among the patients, without regard to the length of stay in the ED. The results indicate that patients with long stays were not neglected in the area of pain reassessments. There is no support for the idea that the longer the patient remains in the ED awaiting transfer to a critical care unit, the less attention the patient receives.

There was no correlation between the first pain medication and the first reassessment of pain. While this is puzzling, a possible explanation is that reassessment of pain is not as high a priority once pain medication has been given. It is also possible that patients are reassessed more often than the ED nurse documents reassessments. The time interval to first pain medication did correlate with quicker EKGs and earlier thrombolytic doses. This may be due to the overall efficient management of the patient undergoing thrombolytic therapy for AMI. However, it must be remembered that correlation or positive association does not mean causation.

The mode of arrival does not impact the speed at which patients' pain is initially assessed, treated with medication and reassessed. This serves to dispel the myth that patients transported by ambulance receive quicker attention in the ED. Those transported by ambulance did receive EKGs earlier than those transported by POV. This is an expected finding because all ambulance crews contact the ED of destination with a report on the patient's status, symptoms, history and estimated time of arrival. This enables the ED staff to be ready with an EKG at the bedside for immediate application.

Those transported by ambulance also received thrombolytics sooner than those transported by POV. This may be partially explained by the earlier EKGs received by the ambulance patients. Often the patient transported by ambulance had a 12 lead EKG prior to arrival, so the first EKG in the ED was actually the second in the current episode of chest pain. Diagnosis of AMI may have been facilitated and thus expedited the physicians' orders for thrombolytic administration. This possible

explanation cannot be substantiated, however, because physicians did not include documentation of time of diagnosis nor time of treatment orders.

Limitations of the Study

An apparent limitation of this study relates to the small number of subjects within the sample. Two years of thrombolytic therapy administered in the ED for AMI yielded a sample of only 81 records for retrospective chart review. The chance of detecting differences between subgroups is small.

Additionally, the source of records was from a single acute care facility. It is not clear if this sample is representative of the whole patient population. Therefore, the investigator urges caution against generalizing the findings of this study. Another limitation relates to the research design. In this retrospective chart review, data were obtained from existing documentation only. It is possible that the documentation is not accurate, expecially the documentation of reassessment of pain.

Suggestions for Further Research

In the nursing profession, research studies concerning the issue of pain management in the ED are limited. Research concerning pain management during labor intensive, time dependent situations such as thrombolytic therapy for AMI is very scarce. More studies are needed on this issue and the following examples are only a few suggestions:

1. Replicate the study with a larger sample size from a variety of Eds.

2. Prospective study to determine the relationship between observed and documented pain management.

3. Compare the effectiveness of alternative pain relief measures with medications.

4. Compare the course of recovery for AMI patients who were pain-free at the time of transfer from the ED and those who remained in pain at the time of transfer.

In summary, the results of this study indicate that pain management is integrated into the ED, but in varying degrees. Professionals cannot guarantee that patients undergoing thrombolytic therapy for AMI will be pain-free. However, professional practice dictates that we prioritize and integrate pain management into whatever diagnostic and therapeutic interventions are appropriate for the benefit of the ED patient.

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APPENDIX A

AHCPR Guidelines Table

Table 9: Summary of drugs commonly used in the emergency department to treat patients with symptoms suggestive of unstable angina

Drug category	Clinical condition	When to avoid[1]	Usual dose (low-high)
Aspirin	Diagnosis of unstable angina or acute MI	Hypersensitivity, active bleeding, severe bleeding risk	324 mg (160-324)
Heparin	Unstable angina in high-risk category and some intermediate-risk patients	Active bleeding, history of heparin-induced thrombocytopenia, severe bleeding risk, recent stroke	80 units/kg IV bolus with constant IV infusion at 18 units/kg/hr titrated to maintain aPTT between 46 and 70 seconds[2]
Nitrates	Ongoing pain or ischemia	Hypotension	Sublingual (1-3 tablets)[3] IV (5-100 μg/min)
Beta blockers	Diagnosis of unstable angina	PR ECG segment >0.24 seconds, 2° or 3° AV block, heart rate <60, systolic blood pressure <90 mmHg, shock, left ventricular failure with CHF, severe reactive airway disease	Oral dose appropriate for specific drug\n\nIV metoprolol (1-5 mg slow IV every 5 minutes to 15 mg total)\n\nIV propranolol 0.5 to 1.0 mg\n\nIV atenolol 5 mg every 5 minutes to 10 mg total
Narcotics	Persistent pain following initial therapy with nitrates and beta blockers	Hypotension, respiratory depression, confusion, obtundation	Morphine sulfate 2 to 5 mg IV

[1] Allergy or prior intolerance contraindication for all.

[2] Dose regimen assumes a mean control aPTT of 30 seconds and a therapeutic goal of 1.5 to 2.5 times control.

[3] Patients with symptoms suggestive of unstable angina and ongoing pain should be given sublingual NTG 0.3 to 0.4 every 5 minutes until discomfort is relieved, three tablets have been given, or limiting symptoms or signs develop. If discomfort is still present after three tablets, IV NTG should be started promptly at a dose of 5 μg/min and titrated up to 75 to 100 μg/min or limiting side effects.

Note: Some of the recommendations in this guideline suggest the use of agents for purposes or in doses other than those specified by the Food and Drug Administration (FDA). Such recommendations are made after consideration of concerns regarding nonapproved indications. Where made, such recommendations are based on more recent clinical trials or expert consensus.

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AHCPR

Agency for Health Care Policy and Research

It is a pleasure to send you the enclosed material.

Please see the message inside.   Thank
you.

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301/227-8364

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NHLBI will appreciate citation as to source
using the suggested format located on page V
of the clinical practice guideline.

If I can be of further assistance, please feel
free to contact me at (301) 594-1364, X188.

Judy Wilcox

March 20, 1996

Marian B. Nutt
Maj, USAF, NC
34238 1st Place So. Apt B
Federal Way, WA 98003

Agency for Health Care Policy and Research
Executive Office Center, Suite 501
2101 East Jefferson Street
Rockville, MD 20852

To whom it may concern:
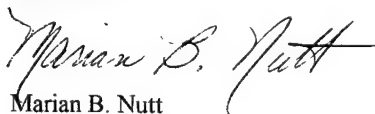
I am presently an Active Duty Air Force Nurse and a graduate student in the Master of Nursing program at the University of Washington/Seattle. My thesis entitled "Emergency Department Pain Management during Thrombolytic Therapy for Acute Myocardial Infarction" will be completed by June 1996.

Your Clinical Practice Guideline Number 10, "Unstable Angina: Diagnosis and Management" has been a valuable resource to me.

I request written permission to use one of your tables as it appears on page 38 in AHCPR Publication No.94-0602, May 1994(amended).

For your convenience, I have enclosed a stamped self-addressed envelope. I hope you will be able to respond promptly and I thank you for your consideration.

Sincerely,

Marian B. Nutt
Maj, USAF, NC

APPENDIX B

Study Facility's Standing Orders

Admitted as: ☐ Inpatient   ☐ Observation   ☐ <24 hours

1. Cardiac monitor, bedrest with commode, vital signs q2h x 24h or more often as needed, I&O q8h, weight on admission and q A.M., O: at 4L/min nasal cannula or mask prn.

2. EKG on admission, chest x-ray.

3. Notify Pharmacy with weight and allergies to obtain required infusions.

4. Start 2 peripheral IVs and one antecubital IV.

5. Draw all blood work through antecubital IV line until 24 hours after thrombolytic infusion.

6. Aspirin 325mg (non-enteric) STAT PO or RS, then enteric coated aspirin 325mg PO QD.

7. Lab work on admission: CPK with MB fraction, CBC with platelets, SMA, PT, PTT, Urinalysis. (No arterial blood gases).

8. Morphine Sulfate up to 15mg IV or Hydromorphone up to 2mg IV, titrate for chest pain.

9. IV Nitroglycerin infusion, start at 10mcg/min and increase by 5-10mcg q 5 min to titrate to pain and blood pressure >100 systolic.

10. ____Strepotokinase 1.5 million units in D5W 50ml, 25ml over 15 minutes, then 25ml over 45 minutes. Total infusion over 1 hour
    ____r-TPA 15mg bolus over 2 minutes. 2) 0.75mg/kg over 30 minutes (not more than 50mg), 3) 0.5mg/kg over 60 minutes (not more than 35mg). Total dose less than or equal to 100mg.

11. Follow thrombolytic therapy with 50 ml D5W at 200ml/hr to clear tubing. Magnesium Sulfate 2 grams IV over 10 to 15 minutes, followed by Magnesium Sulfate 16 grams in D5W 500ml over 24 hours.

12. Bolus with Heparin 5000 units IV push and immediately start Heparin drip at 1000 units/hr continuous infusion, or may use Standard Intravenous Heparin Administration Orders. Begin Heparin within one hour of start of thrombolytic therapy.

13. If BP less than 100 systolic, start Dopmaine drip and titrate to keep blood pressure greater than or equal to 100 systolic.

14. CPK with MB fraction q8h x 2 (3 CPK total).

15. PTT and hematocrit q A.M. x 3.

16. PTT 6 hours after starting Heparin and call results if PTT less than 50 or greater than 80.

17. EKG q A.M. x 2. Obtain STAT EKG with onset of chest pain. NOTIFY MD.

18. Symptomatic, sustained ventricular arrhythmias give Lidocaine 50-100mg bolus and hang 2mg/min infusion.

19. Atropine 0.5-1mg IV for symptomatic bradycardia less than 50 beats/min, may repeat x 1, NOTIFY MD.

20. Defibrillation or cardioversion per ACLS protocol or CCU preprinted orders.

21. Hematest all stools and emesis.

22. Docusate Na 250mg PO BID.

23. Droperidol 1.25mg IV q6h prn nausea.

24. Temazepam 15mg PO QHS prn sleep, may repeat x 1.

25. Diazepam 5mg PO q6h prn anxiety.

26. Acetaminophen 650mg PO q4h prn minor discomfort.

27. Advance diet as tolerated to 5 gram sodium, low cholesterol diet.

28. No IM injections while on anticoagulant therapy.

   Note: These orders should be reviewed by the attending physician, appropriately modified for the individual patient and signed below.

Physician Signature _____ Date _____ Time _____

ACUTE MYOCARDIAL INFARCTION
THROMBOLYTIC ORDERS

PHYSICIAN'S ORDERS

APPENDIX C

Original Quality Assurance Form

DATA RETRIEVAL FORM
(adapted from MARKER SYSTEMS)

UNIT_____

DATE_____ .

AUDITOR:_____

_____

ASPECT OF CARE

Thrombolytic Administration

Patient Medical Record Number	EKG done within 10 min of arrival	Agent started within 60 min.*S-	Time arrived In ED	Time left ED	Agent administered	Complications? Indicate in comments	Ultimate outcome S = surv. D=died	Pain assessment documented 1-10	Med effectiveness documented	Mode of arrival	Comments

Standard

APPENDIX D

Modified Data Retrieval Form

MODIFIED DATA RETRIEVAL FORM

ED Pain Management during Thrombolytic Therapy for AMI

UNIT   Emergency Dept.   LEGEND (see attachment)

DATE   _____   INVESTIGATOR _____

INDICATORS

SAMPLE ITEM NUMBER	A Mode of arrival	Meds given prior to arrival in ED	B Time arrived in ED	C Time left ED	D Total time in ED	E Meds given in ED	F Thrombolytic agent given	G Time thrombolytic agent started	H Time of first EKG	I Time of first pain assessment	J Time of first pain med given	K Time pain med effectiveness documented	L Total number of pain reassessments	M Demographics	N
													a	s	t

MODIFIED DATA RETRIEVAL FORM - LEGEND

A. Mode of Arrival   1 = Ambulance
                        2 = Private vehicle

B. Medications given prior to arrival in ED
F. Medications given in ED
                        1 = Aspirin
                        2 = Nitrates
                        3 = Heparin
                        4 = Beta Blockers
                        5 = Narcotics

C. Time arrived in ED
D. Time left ED
 J. Time of first pain assessment
K. Time of first pain medication administered
H. Time thrombolytic agent initally administered
 I. Time of first 12 lead EKG
L. Time med effectiveness documented after dose given

                        actual time   00:01 - 24:00 hours

E. Total time in ED
                        actual time in minutes

G. Thrombolytic agent administered
                        1 = Tissue Plasminogen Activator
                        2 = Streptokinase

M. Total number of pain reassessments
                        =   actual number

N. Demographics:
    age - in years   Tobacco use   Ethnicity
                            0 = never   1= Caucasian
                            1 = currently   2= African Am.
    sex - 1 = male   2 = previously   3= Hispanic
          2 = female   4= Native Am.
                                                 5=Asian/ Pacific I.
                                                 6=Other

+ indicates that a simple pain scale (1-10) was documented.
Deaths in the ED will be indicated by * in the sample item column.
Comments are included under sample item numbers on additional pages as required.

                                                        MBN 96

APPENDIX E

Human Subjects Form

Form UW 13-11 (Rev. 7/94)

UNIVERSITY OF WASHINGTON

CONFIDENTIAL

Human Subjects Division
Grant and Contract Services — Subjects Division

HUMAN SUBJECTS REVIEW COMMITTEE APPLICATION

MAR 0 5 1996

Please indicate name and application number on all correspondence

BOX FOR COMMITTEE USE ONLY	
MASTER ☐	COMMITTEE ☐
REVIEWER ☐	INVESTIGATOR ■

26-0650-E
APPLICATION NO.

Submit **nine** copies (including one copy with original inked signatures) and all relevant materials (consent forms, questionnaires, instruments, data collection forms, debriefing statement, advertisements, etc.) to the Human Subjects Division, JM-22. Do not leave blanks. Submit **one** copy of each grant or contract proposal, and one copy of the protocol and investigator's brochure for clinical drug trials. Students should submit one copy of thesis or dissertation proposals. For information and assistance, call 543-0098. Handwritten and/or incomplete forms will be returned.

L. INVESTIGATORS AND ASSOCIATES (Correspondence will be directed to name of first person listed):

NAME	POSITION	DEPARTMENT/DIVISION	MAIL STOP	TEL./FAX Nos.
Marian Nutt	Graduate Student	Biobehavioral Nursing	35266	(206)815-1052
Terri Simpson	Ass. Professor	Biobehavioral Nursing	35266	(206)616-1461
Eleanor Bond	Ass. Professor	Biobehavioral Nursing	35266	(206)616-1964
Kathleen Flarity	Clinical Faculty	Tacoma General - E D Hospital	TGH-ED	(206)552-1732

II. TITLE OF ACTIVITY: E D Pain Management During Thrombolytic Therapy for A M I

III. TIME PERIOD FOR INVOLVEMENT OF HUMAN SUBJECTS: FROM Mar 1996 TO Jun 1996

IV. ELIGIBLE FOR EXPEDITED REVIEW? [XX] YES (SEE MANUAL FOR DEFINITION OF EXPEDITED REVIEW).

V. FUNDING INFORMATION: LIST ALL GRANT AND CONTRACT INFORMATION ON PAGE 2. IF NONE. CHECK HERE [XX]

VI. SIGNATURES: The undersigned acknowledge that this application represents an accurate and complete description of the proposed research; that the research will be conducted in compliance with the recommendations of and only after approval has been received from the Human Subjects Review Committee (HSRC); that the principal investigator is responsible for reporting any serious adverse events or problems to the HSRC, for requesting prior HSRC approval for modifications, and for requesting annual review and approval; and that if this research will not be peer-reviewed by a funding agency, it has received intra-mural review for scientific merit.

A. Investigator: Marian B. Nutt _____ _(signature)_ 1 Mar 96
TYPED NAME PLUS SIGNATURE   DATE

B. Faculty sponsor (for student): Terri Simpson _(signature)_ March 4, 1996
TYPED NAME PLUS SIGNATURE   DATE

C. Department Chairman: Joan Shaver _(signature)_ 3/3/96
TYPED NAME PLUS SIGNATURE   DATE

(signature) Helen McGough /aP   MAR 0 7 1996 APPROVE ☒ DISAPPROVE ☐
HUMAN SUBJECTS REVIEW COMMITTEE CHAIRMAN'S SIGNATURE   DATE

Subject to the following conditions: Submit one copy of Confidentiality agreement negotiated with Tacoma General Hospital for access to records for research purposes.

Period of approval is one year. from MAR 0 7 1996 through MAR 0 6 1997

VALID ONLY AS LONG AS APPROVED PROCEDURES ARE FOLLOWED

APPENDIX F

Letter of Permission and Oath

Master's Thesis

In presenting this thesis in partial fulfillment of the requirements for a Master's

degree at the University of Washington, I agree that the Library shall make its copies

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Signature _Marian B. Nutt_

Date _6 June 96_

March 28,1996

Marian B. Nutt, R.N., BSN
34238 1st Place South, Apt B
Federal Way, WA 98003

Richard Shine, R.Ph.
Investigational Review Board - Co-Chairman
MultiCare Health System
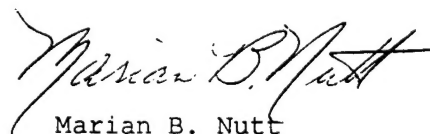P.O. Box 5299
Tacoma, WA 98415-0299

Dear Dr. Shine:

This letter is written to fulfill the requirements
of the University of Washington Human Subjects Review Board
for a contract of confidentiality.

As a graduate student in School of Nursing, I am
preparing my thesis in partial fulfillment of the
requirements for Master in Nursing. The title of the thesis
is "Emergency Department Pain Management During Thrombolytic
Therapy for Acute Myocardial Infarction." The design is a
retrospective chart review. All data will be collected at
the Tacoma General Hospital. I am the investigator who will
have access to the raw data within the medical charts.

I hereby agree that all data will be recorded in a
manner that subjects cannot be identified and that the data
will be reported in aggregate form only. The data will be
destroyed one month after completion and approval of the
final study by the thesis committee.

To this oath of confidentiality I affix my
signature below on this date, March 28, 1996.

Marian B. Nutt